Claims

1. A foamed porous membrane of at least one thermoplastic polymer, wherein the membranes have a proportion of open cells of at least 80%, a void fraction of at least 75%, and an open-pore pore size distribution with a standard deviation of ±10% of the average pore diameter.

2. The membrane of claim 1 wherein said membrane has a pore diameter in the microfiltration range of from 0.05 μm to 30 μm.

3. The membrane of claim 1 wherein said membrane has a pore diameter in the macrofiltration range of from greater than 30 μm to 200 μm.

4. The membranes of any of claims 1-3 wherein said membrane is reinforced on at least one side.

5. The membrane of claim 4 wherein said at least one thermoplastic polymer is selected from the group consisting of substituted and unsubstituted cellulose derivatives, polyolefins, polyesters, polysulfones, polyethersulfones and polyamides.

6. In a method of making a foamed porous membrane wherein a polymer melt comprising at one thermoplastic polymer in a form selected from amorphous and partially crystalline is delivered at an initial processing temperature greater than the glass transition temperature of said at least one thermoplastic polymer through an extruder under superatmospheric pressure, charged with a cell former in an injection stage, fed to a post-injection stage mixing stage by a first melt pump for cooling the temperature and/or elevating the pressure of said polymer melt, and then forced through a die by said first melt pump to form the membrane, and wherein said cell former is charged in response to the pressure drop occurring upon passage of said polymer melt through said die, the improvement comprising charging the polymer melt with at least two fluids selected from gases and

liquids and a mixture of a gas and a liquid having different diffusion rates, and the use of a second melt pump in said second mixing stage to force said polymer melt through said die.

7. The method of claim 6 wherein said polymer melt is lowered to a temperature at least 50 C below said initial processing temperature.

8. The method of claim 6 wherein the pressure of said polymer melt in said post-injection stage mixing stage is elevated to greater than 150 bar.

9. The method of claim 6 wherein said polymer melt is charged with a liquid cell-forming fluid.

10. The method of claim 6 wherein said cell former comprises carbon dioxide and water.

11. The method of any of claims 6-10 wherein said polymer melt is produced from at least one thermoplastic polymer selected from the group consisting of substituted and unsubstituted cellulose derivatives, polyolefins, polyesters, polysulfones, polyethersulfones and polyamides.

12. In an apparatus for making a foamed porous membrane comprising an extruder equipped with a metering apparatus and heating elements to form a polymer melt, said extruder having a cylinder connected via a first melt pump to a die for extrusion of a membrane from said polymer melt, an injection stage before said first melt pump for charging said polymer melt with a cell former, a heat exchanger located between said first melt pump and said die to form a second mixing stage, the improvement comprising a second melt pump located upstream from said die for forcing said polymer melt through said die.

13. The apparatus of claim 12 wherein said heat exchanger is equipped with a mixer.

14. The apparatus of claim 13 wherein said mixer is a static mixer.

15. The apparatus of claim 12 wherein said injection stage comprises metering pumps that are

connected via hollow needles and plates so as to be in fluid communication with said cylinder of said extruder.

16. The apparatus of claim 15 wherein said metering pumps are equipped with coolable pump heads.

17. The apparatus of claim 12 wherein said die is configured as a wide-slit nozzle.